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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/684,590	10/15/2003	Manabu Shiozaki	50212-545	2328

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EXAMINER	
LAVARIAS, ARNEL C	
ART UNIT	**PAPER NUMBER**
2872	

DATE MAILED: 04/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/684,590	SHIOZAKI ET AL.	
	Examiner	Art Unit	
	Arnel C. Lavarias	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *6/9/04,3/19/04,10/15/03*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/9/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. The drawings were received on 10/15/03. These drawings are acceptable.

Specification

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. *The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided.* The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

4. The abstract of the disclosure is objected to because of the following informalities:

Abstract, line 3- 'comprises' should read 'includes'.

Correction is required. See MPEP § 608.01(b).

5. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

6. Claims 1-15 are objected to because of the following informalities:

Claim 1 recites the following limitation which occurs in parentheses in line 14: ($n_1 < n_2$). It is unclear whether this limitation is part of the claimed invention. It is suggested that 'wherein $n_1 < n_2$' be used instead. Claims 2-15 are dependent on Claim 1, and hence inherit the deficiencies of Claim 1.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 3, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. (H. T. Nguyen, B. W. Shore, S. J. Bryan, J. A. Britten, R. D. Boyd, M. D. Perry, 'High-efficiency fused-silica transmission gratings', Opt. Lett., vol. 22, no. 3, February 1, 1997, pp. 142-144.).

Nguyen et al. discloses a transmitted type diffractive optical element (See Figure 1) comprising a transparent plate formed with a diffraction grating, the transparent plate having first and second surfaces parallel to each other; the first surface being in contact with a medium and formed with the diffraction grating, the second surface being provided with an antireflection film; wherein, when light is incident on the first surface of the transparent plate from the medium, there are a wavelength λ and an incident angle θ of the light satisfying the correlation expressions of $\frac{(2n_1L)}{\lambda}\sin\theta \approx 1$ (See Page 142; It is noted that this is just the standard Bragg or Littrow condition for diffraction gratings and that the diffraction grating disclosed by Nguyen et al. operates using this condition; Nguyen et al. discloses n_1=1 (air), L=350 nm, λ=351 nm (frequency tripled Nd-YAG laser), θ=30°) and $\frac{n_2}{n_1} \leq 3\sin\theta$ (n_2=1.44920 for fused silica near 350 nm), where n_1 is the refractive index of the medium, n_2 is the refractive index in the first surface of the transparent plate wherein $n_1 < n_2$, and L is the period of the diffraction grating; and wherein, at the wavelength λ and incident angle θ, transmitted first-order diffracted light in a TE polarization mode has a diffraction-efficiency η_{TE} of at least 0.8, and transmitted first-order diffracted light in a TM polarization mode has a diffraction efficiency η_{TM} of at least 0.8 or 0.85 (See Figure 5, particularly at the operating angle of incidence of 30°). Nguyen et al. lacks the incident wavelength being exactly the same as the period of the diffraction grating (or vice versa, the period of the diffraction grating being exactly the same as the incident wavelength) such that $\frac{(2n_1L)}{\lambda}\sin\theta = 1$. However, it would have

been obvious to one having ordinary skill in the art at the time the invention was made to have the incident wavelength being exactly the same as the period of the diffraction grating (or vice versa, the period of the diffraction grating being exactly the same as the incident wavelength) such that $\frac{(2n_1L)}{\lambda}\sin\theta = 1$, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. One would have been motivated to have the incident wavelength being exactly the same as the period of the diffraction grating (or vice versa, the period of the diffraction grating being exactly the same as the incident wavelength) such that $\frac{(2n_1L)}{\lambda}\sin\theta = 1$ for the purpose of having the diffraction grating operate under Bragg or Littrow conditions which maximizes the diffraction efficiency of the transmitted diffracted light. *In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235.*

9. Claims 5, 7, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. in view of Gerritsen et al. (H. J. Gerritsen, M. L. Jepsen, 'Rectangular surface-relief transmission gratings with a very large first-order diffraction efficiency (~95%) for unpolarized light', Appl. Opt., vol. 37, no. 25, September 1, 1998, pp. 5823-5829.), of record.

Nguyen et al. discloses the invention as set forth above in Claim 1, except for the diffraction efficiencies η_{TE} and η_{TM} being at least 0.9 or the diffraction efficiencies η_{TE} and η_{TM} having a difference of 0.05 or 0.025 or less therebetween at the wavelength and incident angle. However, Gerritsen et al. teaches that for surface-relief type transmission

gratings, the various grating parameter, e.g. wavelength, incidence angle, refractive index of the grating surface, grating period, fill factor, may be varied to achieve extremely high diffraction efficiencies (See Sections 1-2). In particular, Gerritsen et al. teaches that by varying such parameters, one may achieve, for example, diffraction efficiencies η_{TE} and η_{TM} that are both at least 0.9 or the diffraction efficiencies η_{TE} and η_{TM} having a difference of 0.05 or 0.025 or less therebetween at a particular wavelength and incident angle (See for example Figures 6, 7). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the diffraction efficiencies η_{TE} and η_{TM} be at least 0.9 or the diffraction efficiencies η_{TE} and η_{TM} having a difference of 0.05 or 0.025 or less therebetween at the wavelength and incident angle, as taught by Gerritsen et al., in the optical element of Nguyen et al., for the purpose of optimizing the diffraction efficiency of the transmitted diffracted light, particularly in applications where high diffraction of unpolarized light is a requirement (e.g. spectroscopy or daylighting illumination).

10. Claims 2, 4, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. in view of Hoose et al. (U.S. Patent No. 6724533).

Nguyen et al. discloses the invention as set forth above in Claims 1, 3, 14, except for the wavelength being a value between 1.26-1.675 μm and falling within a predetermined wavelength band, each of the diffraction efficiencies being at least 0.8 or 0.85 in the whole predetermined wavelength band. However, Hoose et al. teaches a similar diffractive grating structure (See for example Figures 1, 3-4, 7-8) having grating parameters, which have been chosen and optimized for operation in the wavelength range

of approximately1.52-1.58 μm (See col. 3, line 42-col. 6, line 23). In this wavelength range, the diffraction efficiencies are at least 0.8 or 0.85 in the whole predetermined wavelength band (See for example Figure 9). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the wavelength be a value between 1.26-1.675 μm and falling within a predetermined wavelength band, each of the diffraction efficiencies being at least 0.8 or 0.85 in the whole predetermined wavelength band, as taught by Hoose et al., in the optical element of Nguyen et al., for the purpose of optimizing the diffraction grating for extremely high transmission diffraction efficiency that is essentially independent of wavelength over the wavelength band of interest.

11. Claims 6, 8, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. in view of Gerritsen et al. as applied to Claims 1, 3, 5, 7, 9, 14 above, and further in view of Hoose et al.

Nguyen et al. discloses the invention as set forth above in Claims 1, 3, 5, 7, 9, 14, except for the diffraction efficiencies being at least 0.9 in the whole predetermined wavelength band or the maximum and minimum values of the diffraction efficiencies having a difference of 0.05 or 0.025 or less therebetween in the whole predetermined wavelength band. However, Hoose et al. teaches a similar diffractive grating structure (See for example Figures 1, 3-4, 7-8) having grating parameters, which have been chosen and optimized for operation in the wavelength range of approximately1.52-1.58 μm (See col. 3, line 42-col. 6, line 23). In this wavelength range, the diffraction efficiencies are at least 0.9 in the whole predetermined wavelength band (See for example Figure 9).

Further, over this wavelength band, the maximum and minimum values of the diffraction efficiencies have a difference of 0.05 or 0.025 or less (See for example Figure 9). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the diffraction efficiencies being at least 0.9 in the whole predetermined wavelength band or the maximum and minimum values of the diffraction efficiencies having a difference of 0.05 or 0.025 or less therebetween in the whole predetermined wavelength band, as taught by Hoose et al., in the optical element of Nguyen et al., for the purpose of optimizing the diffraction grating for extremely high transmission diffraction efficiency that is essentially independent of wavelength over the wavelength band of interest, and the grating also being polarization independent over the wavelength band of interest.

12. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. in view of Hoose et al.

Nguyen et al. in view of Hoose et al. discloses the invention as set forth above in Claims 2, 4, 15, except for the predetermined wavelength band including the C band, the L band or both the C and L bands. However, Hoose et al. further discloses that the predetermined wavelength band includes the C band wavelengths (See for example Figures 2, 6, 9 in Hoose et al.), as well as L band wavelengths (See Figure 9 of Hoose et al.). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the predetermined wavelength band include the C band, the L band or both the C and L bands, as further taught by Hoose et al., in the optical element of Nguyen et al. in view of Hoose et al., to take advantage of the

extremely high diffraction efficiency of the diffractive optical element in high bandwidth optical communication transmissions.

13. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al. in view of Gerritsen et al., and further in view of Hoose et al.

Nguyen et al. in view of Geritsen et al., and further in view of Hoose et al. disclose the invention as set forth above in Claims 6, 8, 10, except for the predetermined wavelength band including the C band, the L band or both the C and L bands. However, Hoose et al. further discloses that the predetermined wavelength band includes the C band wavelengths (See for example Figures 2, 6, 9 in Hoose et al.), as well as L band wavelengths (See Figure 9 of Hoose et al.). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the predetermined wavelength band include the C band, the L band or both the C and L bands, as further taught by Hoose et al., in the optical element of Nguyen et al. in view of Gerritsen et al., and further in view of Hoose et al., to take advantage of the extremely high diffraction efficiency of the diffractive optical element in high bandwidth optical communication transmissions.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 9:30 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Arnel C. Lavarias
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4/1/05